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The NEFSC Surveys: Longest Running Plankton Time Series in the Northwest Atlantic

The Northeast Fisheries Science Center (NEFSC) started continuous plankton recorder or CPR surveys in the early 1970's when they took over operations on a route across the Gulf of Maine from the predecessor to SAHFOS, the Sir Alister Hardy Foundation for Ocean Science. This change in operation was enabled by a 1972 Aide-Memoire between the U.S. and the U.K. Natural Environment Research Council.

Currently the NEFSC's Oceanography Branch conducts two monthly continuous plankton recorder transects off the east coast of the US, one across the Gulf of Maine and the other across the Mid-Atlantic Bight. It is the second longest running CPR program, after that of SAHFOS, and the longest running plankton time-series in the Northwest Atlantic.

Ship of Opportunity Program (SOOP) transect surveys have been conducted monthly aboard cooperating commercial vessels during their routine transits across the Gulf of Maine since 1961 (see map), and from New York towards Bermuda across the Mid-Atlantic Bight since 1971.

The vessel currently used on the Gulf of Maine route is the 416-foot M/V Reykjafoss, made available for oceanographic research by EIMSKIP. The Icelandic company operates four shipping routes in the North Atlantic and tows CPRs for both SAHFOS and NEFSC. Sampling on the Mid-Atlantic Bight route is conducted from the 389-foot M/V Oleander operated by Bermuda Container Line between Hamilton, Bermuda and New York (via Port Newark-Elizabeth Marine Terminal in New Jersey).

The Gulf of Maine transect was originally established in 1961 by the Oceanographic Laboratory at Edinburgh, Scotland. Responsibility for operating the route between Boston, Mass. and Halifax, Nova Scotia, about 425 kilometers (265 miles), was later transferred to NOAA and NEFSC in 1974. Between 1974 and October 2011, NEFSC conducted 421 CPR tows on the Gulf of Maine transect.

Chris Melrose, a research oceanographer at NEFSC's Narragansett, R.I., Laboratory and head of the Center's long-term SOOP, knows firsthand what is involved, having sailed several times as a rider on the New York to Bermuda route, most recently in November 2011. Tows are usually put in the water right after the ship leaves port and extend about 450-500 km (roughly 280-310 miles) from New York off the edge of the Continental Shelf and just past the

Gulf Stream. In 2011 a second tow was added by the Oceanography Branch where the first left off to extend the survey all the way to Bermuda across the Sargasso Sea.

“I’m new to this project and am learning a lot from colleagues around the world, many of whom have been involved in CPR surveys and plankton research for decades,” Melrose said. “It is great to be a part of a global scientific effort like GACS, and to be able to collaborate with the diverse group of people and organizations that worked together to make GACS happen.”

The collaboration and cooperation of the shipping companies and the vessel crews has been another key to the success of the Ship of Opportunity Program, given the limited resources available to conduct research at sea aboard dedicated scientific vessels and especially for consistent monthly time-series spanning decades along the same routes.

Basic equipment, maintenance and ship rider training are provided by NEFSC. Daniel E. Smith of the Narragansett Laboratory has been transporting riders and equipment to vessels and working with the ship’s crews since the beginning of NEFSC’s CPR program. Smith also maintains all of the program’s CPR equipment and makes sure the samples get to the lab for analysis each month.

"These CPR studies have become part of a broader ship of opportunity (SOOP) program in NOAA,” Melrose said. “We collect a variety of oceanographic and environmental data along the established track lines and maintain equipment on the vessels, some of it on behalf of NOAA’s Atlantic Oceanographic and Meteorological Laboratory in Miami. In addition to the CPR tows, the time series includes XBT (expendable bathythermograph, which measures temperature versus depth) casts, thermosalinograph (TSG, which measure sea surface temperature and salinity), and dissolved carbon dioxide for ocean acidification studies. The New York to Bermuda route also includes an acoustic Doppler current profiler (ADCP) operated by the University of Rhode Island and Stony Brook University.

The CPR surveys supplement other oceanographic sampling efforts, which can be more intensive but less frequent, by research vessels dedicated to a specific program or project, including NOAA ships and those operated by other agencies and organizations. NEFSC, for example, has conducted a long-term ecosystem monitoring program in the Northwest Atlantic called EcoMon. In 2010 NASA and Old Dominion University joined with NEFSC to measure carbon distributions and primary productivity in the Northwest Atlantic to help scientists worldwide determine the impacts of a changing climate on ocean biology and biogeochemistry. The study, Climate Variability on the East Coast or CliVEC, (http://www.nefsc.noaa.gov/press_release/2010/SciSpot/SS1004/) will also help validate ocean color satellite measurements and refine biogeochemistry models of ocean processes.

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